

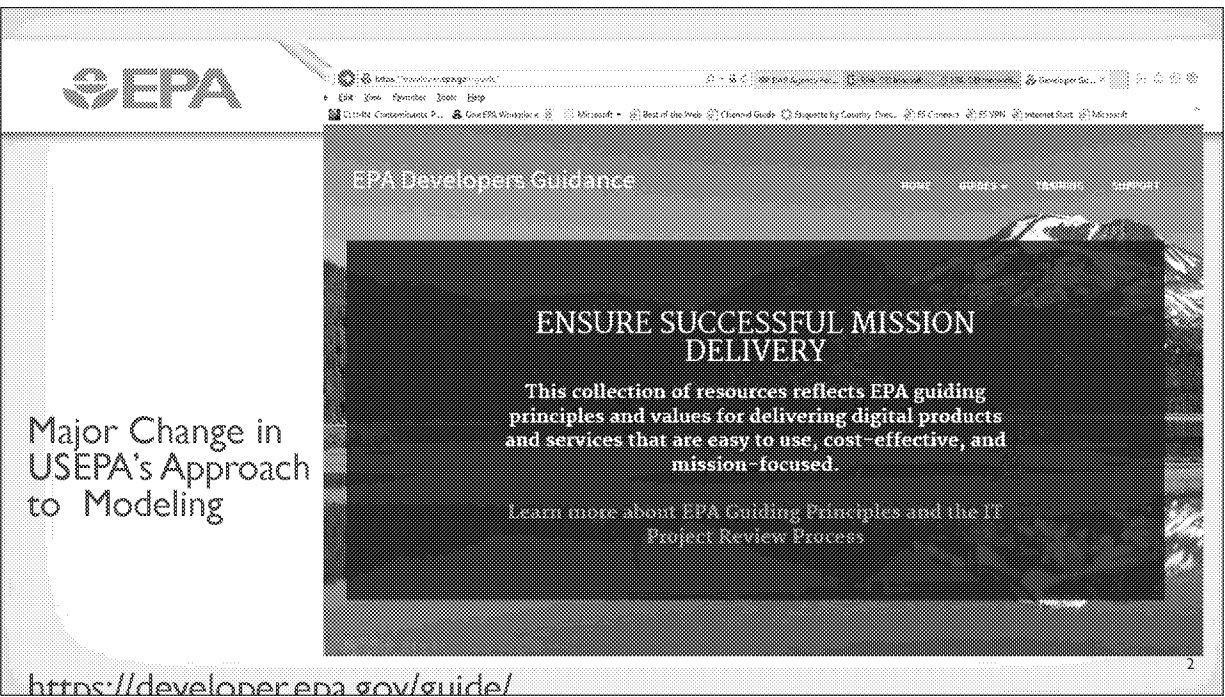


USEPA's Future Role for the Storm Water Management Model (SWMM)

Michelle Simon, United States Environmental Protection Agency
International Conference of Water Management Modeling
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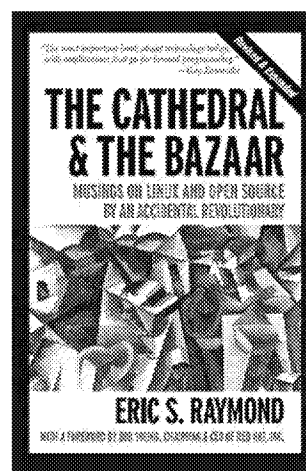
Lewis A. Rossman, US EPA Emeritus

Storm Water Management Model Climate Adjustment Tool (SWMM-CAT)



- The *Cathedral* model, in which source code is available with each software release, but code developed between releases is restricted to an exclusive group of software developers.

- The *Bazaar* model, in which the code is developed over the Internet in view of the public.



Raymond points to 19 "lessons" learned from various software development efforts, each describing attributes associated with good practice in open source software development:[3]

Every good work of software starts by scratching a developer's personal itch.

Good programmers know what to write. Great ones know what to rewrite (and reuse).

Plan to throw one [version] away; you will, anyhow. (Copied from Frederick Brooks' The Mythical Man-Month)

If you have the right attitude, interesting problems will find you.

When you lose interest in a program, your last duty to it is to hand it off to a competent successor.

Treating your users as co-developers is your least-hassle route to rapid code improvement and effective debugging.

Release early. Release often. And listen to your customers.

Given a large enough beta-tester and co-developer base, almost every problem will be characterized quickly and the fix obvious to someone.

Smart data structures and dumb code works a lot better than the other way around.

If you treat your beta-testers as if they're your most valuable resource, they will respond by becoming your most valuable resource.

The next best thing to having good ideas is recognizing good ideas from your users. Sometimes the latter is better.

Often, the most striking and innovative solutions come from realizing that your concept of the problem was wrong.

Perfection (in design) is achieved not when there is nothing more to add, but rather when there is nothing more to take away. (Attributed to Antoine de Saint-Exupéry)

Any tool should be useful in the expected way, but a truly great tool lends itself to uses you never expected.

When writing gateway software of any kind, take pains to disturb the data stream as little as possible—and never throw away information unless the recipient forces you to!

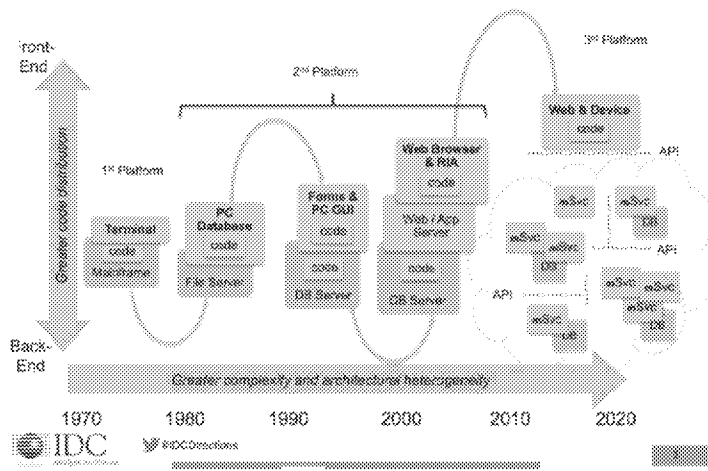
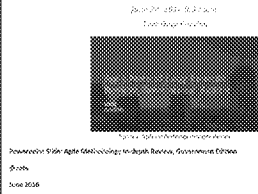
When your language is nowhere near Turing-complete, syntactic sugar can be your friend.

A security system is only as secure as its secret. Beware of pseudo-secrets.

To solve an interesting problem, start by finding a problem that is interesting to you.

Provided the development coordinator has a communications medium at least as good as the Internet, and knows how to lead without coercion, many heads are inevitably better than one.

Agile Methodology In-Depth Review

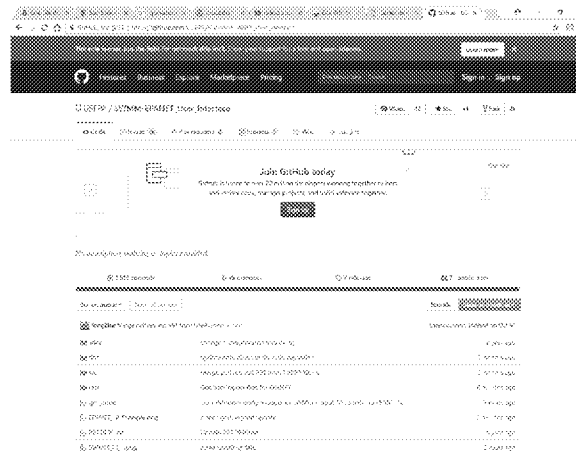


The **open-source model** is a decentralized software-development model that encourages open collaboration. A main principle of open-source software development is peer production, with products such as source code, blueprints, and documentation freely available to the public. The open-source movement in software began as a response to the limitations of proprietary code. The model is used for projects such as in open-source appropriate technology, and open-source drug discovery.

Straight from Wikipedia

- Branch,
- Commit,
- Pull,
- Tag,
- Fork,
- Evaluate,
- Release

- Iterative Process



Agile Methodology in-Depth Review

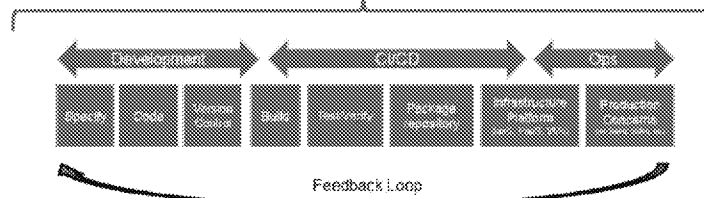
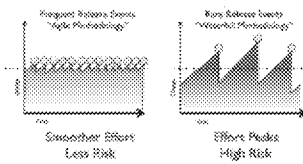
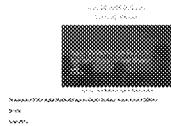


Figure 2.2. Small Batch Process



Strengths and Limitations

Strengths

- Multiple Developers
- More input from the Community

Weaknesses

- Multiple versions of code
- More input from the Community

Add more stuff

- APIs
- Interface with PEST
- Interface with other models - SWAT, HSPF, VELMA, KINEROS2, others

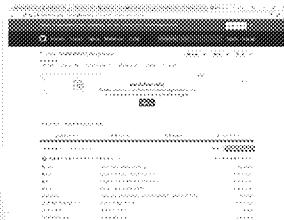
Some thoughts from Arash:

That way SWMM can be incorporated into any program on any platform including web-based programs and also can be coupled with other APIs such as GIS-based tools and parameter estimation tools. That's what the trend in software engineering is. There are APIs for example for QGIS, Tensorflow (for machine learning), OpenCV (for computer vision), ESRI ArcGIS, Paraview (through VTK library) and a lot of other popular open-source tools. A good design allows the API to be fully backward compatible so that the changes that are made to the API will not affect the users but only adds new features and capabilities.



EPA – Curator of SWMM Code

- Continues in-house development
- Cooperate Agreement with NCIMM
- QCs GitHub pull requests
- Periodically releases EPA's Official Version of SWMM



Environmental Project Links & Resources

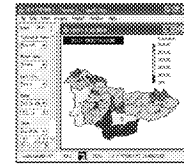
Related Tools: Water Resources

CONTACT US SHARE

Storm Water Management Model (SWMM)

Version 5.1.012 with Low Impact Development Controls

- Installation
- Operation
- Evaluation
- User Manual
- User Guide
- User's Manual
- Model Development
- Contact



Description

EPA's Storm Water Management Model (SWMM) is used throughout the world for planning, analysis, and design related to stormwater runoff, combined and sanitary sewers, and other drainage systems in urban areas. There are many applications for drainage systems in non-urban areas as well.

SWMM is a dynamic hydrology/hydraulic water routing simulation model. It is used for single event or long term (seasonal) simulation of runoff events and quality from primarily urban areas. The runoff component operates on a collection of sub-catchment areas that receive



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• **Extra Slides**



Moving Forward

- Work with stakeholder community to plan future of SWMM
- Continued technical support
- Improve Scientific Aspects of SWMM
 - Automate Calibration, Results Analysis, Uncertainty
 - Improve Water Quality
 - Improve Sediment transport
 - Improve Evapotranspiration
 - Runoff production in urban soils, urban soil hydrology
 - Intergradation with SWAT, HSPF, VELMA, others

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SPARROW